



## Title: Moving with Patterns

### Brief Overview:

This unit explores patterns and various ways to communicate body movements using symbols. Students will demonstrate analytical reasoning by associating a symbol or geometric shape to a specific body movement. Students will create various kinesthetic patterns. The student performance assessment demonstrates the ability to create their movements in a pattern and visually communicate with symbols. They will be able to perform a dance identifying a pattern and communicate that pattern by movement associated with visual symbols. An extension activity will challenge their critical thinking skills by requiring the students to identify an extended pattern term.

### NCTM 2000 Principles for School Mathematics:

- **Equity:** *Excellence in mathematics education requires equity - high expectations and strong support for all students.*
- **Curriculum:** *A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.*
- **Teaching:** *Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*
- **Learning:** *Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.*
- **Assessment:** *Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*
- **Technology:** *Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.*

### Links to NCTM 2000 Standards:

- **Content Standards**

- **Algebra**

- *Understand patterns, relations, and functions.*
    - *Analyze change in various context.*
    - *Use mathematical models to represent and understand quantitative relationships.*

### **Geometry**

- Use visualization, spatial reasoning, and geometric modeling to solve problems.

### **• Process Standards**

#### **Problem Solving**

- *Build new mathematical knowledge through problem solving.*
- *Solve problems that arise in other contexts.*
- *Apply and adapt a variety of appropriate strategies to solve problems.*
- *Monitor and reflect on the process of mathematical problem solving.*

#### **Reasoning and Proof**

- *Recognize reasoning and proof as fundamental aspects of mathematics.*
- *Select and use various types of reasoning and methods of proof.*

#### **Communication**

- *Organize and consolidate their mathematical thinking through communication.*
- *Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.*
- *Analyze and evaluate mathematical thinking and strategies of others.*
- *Use the language of mathematics to express mathematical ideas precisely.*

#### **Connections**

- *Recognize and use connections among mathematical ideas.*
- *Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.*
- *Recognize and apply mathematics in contexts outside of mathematics.*

#### **Representation Standard**

- *Create and use representations to organize, record, and communicate mathematical ideas.*
- *Select, apply, and translate among mathematical representations to solve problems.*
- *Use representations to model and interpret physical, social, and mathematical phenomena.*

### **Grade/Level:**

This unit is targeted for Grades 3 / 4.

### **Duration/Length:**

Three to four class periods

**Prerequisite Knowledge:**

Students should have working knowledge of the following skills:

- Identifying geometric shapes
- Constructing various symbols
- Connecting visual relationships with meaning

**Student Outcomes:**

Students will:

- algebraically represent, model, analyze, and solve mathematical and real-world problems involving patterns and functional relationships.
- generalize rules illustrated in patterns.
- write the rule for a given function.
- solve for the variable in an equation.
- identify, describe and represent geometric figures and real-world art form.
- show direct correlation of a geometric shape to a kinesthetic pattern.

**Materials/Resources/Printed Materials:**











- Music with simple steady beat (rap works well)
- Sentence strips
- Pattern block stickers
- Pattern blocks (a set for each learning group)
- Tape
- Stickers
- Chart paper
- Markers/crayons/colored pencils
- Overhead

**Development/Procedures:****Day 1:**

1. Start the music without instructing the students as to the nature of the lesson.
2. Teacher or trained student starts moving to the beat using the same four pre-designated movements (See Teacher Resource #1.):  
Up and down, bending at the knees.
  - 1) Swaying hips back and forth.
  - 2) Flapping arms like a chicken.
  - 3) Moving head from shoulder to shoulder.

3. An assistant or student holds up sentence strips displaying shape patterns in the order presented on Teacher Resource #2.

4. The teacher follows the patterns as they are displayed. For example:

									
knee bend	knee bend	hip sway	head roll	knee bend	knee bend	hip sway	head roll	knee bend	knee bend

5. Students are given time to make the connection between the movement and the patterns.
6. Once the connection is made, the class will practice a few patterns together and students may volunteer to try some solo.
7. Students work in groups with pattern blocks. Patterns are demonstrated through movement and the groups are asked to represent the movements with their blocks. The teacher circulates, checking for understanding. The following concepts are discussed and written on a “math talk” chart:
- sequence
  - core
  - term
  - pattern

Math talk chart – a large poster size piece of paper displayed clearly and used as a place to record new math terms introduced. Students may refer to the chart when solving problems.

## **Day 2: *Inductive Reasoning with Patterns Using Symbols and Body Movement*** **(Kinesthetic)**

The students will observe a performance by the teacher of a body movement repeated three or more times. The students will verbally identify the term of each body movement in the core of the pattern. They will pair share to assign a letter symbol to each term of the demonstrated body movement. When they have completed this activity, the teacher will informally assess understanding for the symbol relationship with the body movement (kinesthetic) pattern. The class will practice this until students have achieved understanding/mastery. Students will discuss other ways to represent a kinesthetic pattern with symbols. The teacher will introduce a letter symbol for the term in a pattern (e.g., A,A,B,C A,A,B,C). A chart will be displayed (made by the teacher) of a kinesthetic pattern and the students will interpret the pattern using the letter symbol. This will be displayed on a sentence strip and then attached directly below the kinesthetic pattern. The class will discuss other ways to represent a kinesthetic pattern using a variety of available symbols. The student will work individually to construct a visual representation of the kinesthetic pattern on a sentence strip. Once the class has completed this activity they will then attach their strip to the chart displayed. The teacher will be able to assess for understanding. The teacher will display another kinesthetic pattern and ask the students to identify the \_\_\_\_\_ (number) step in narrative form. The product will be assessed using the Narrative Rubric, Teacher Resource #4.

### **Days 3 / 4:**

Teacher will review the math terms from the previous days using the *math talk chart*. The Day One Dance Steps, Teacher Resource #1 will be displayed for the students to reference. Students will work in teams to create a kinesthetic pattern. They will represent their kinesthetic pattern with pattern block stickers on a sentence strip relating to the Day One Dance Steps sheet. The groups will exchange the pattern strips and practice moving to another group's kinesthetic creation. Students will perform the kinesthetic movements and display the pattern block strip.

### **Performance Assessment:**

**Day 1:** The student will be assessed with a clipboard to monitor progress with patterns.

**Day 2:** The student will be assessed using a rubric for creating a symbol representation of the kinesthetic pattern. See Teacher Resource #3. A third assessment will be scored with a writing performance rubric. See Teacher Resource #4.

**Days 3 / 4:** Teacher will lead a discussion on assessment criteria for kinesthetic pattern performance. Students will list criteria that will be used for assessment. Teacher will display the list for the students to view while performing. Teacher will base assessment on the student's criteria list.

### **Extension/Follow Up:**

- Students examine cultural dances to find patterns represented.
- Students make real life connections and display them in the room.
- *One example of a real-life connection would be sign language.*
- Students view various videos on dance to identify patterns.
- Students search the Internet for popular dances in the United States to identify the kinesthetic patterns.
- Students cooperatively create a dance with a kinesthetic pattern and have art students illustrate it with symbols.

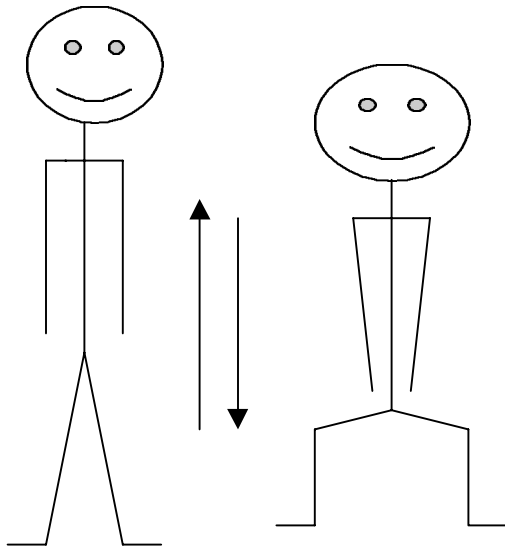
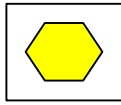
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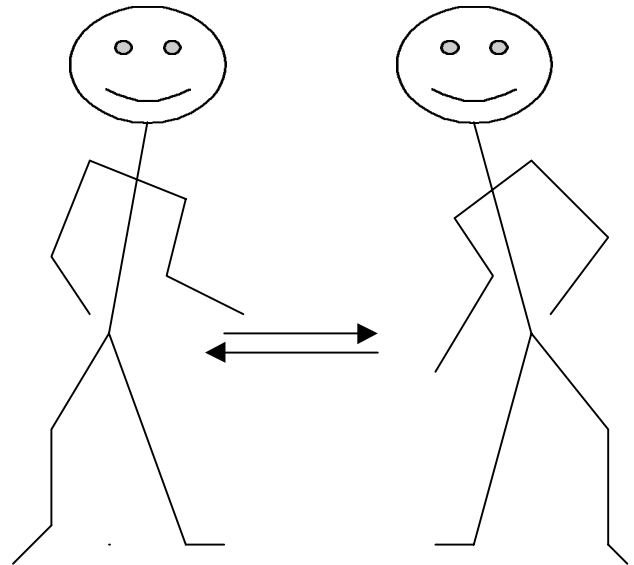
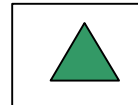
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## Teacher Resource #1 – Day One Dance Steps

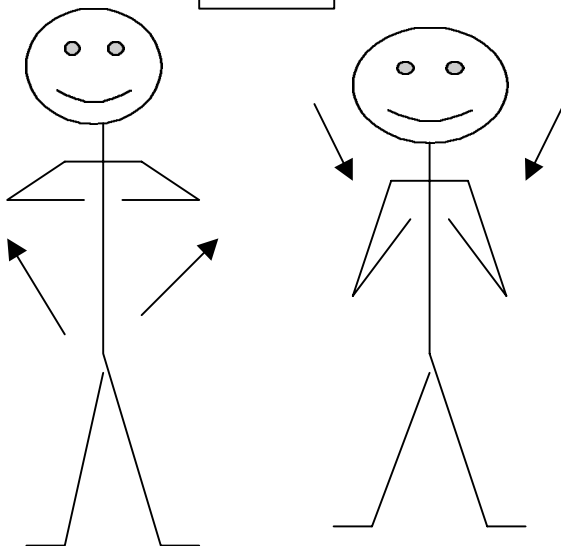
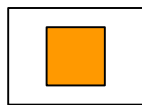
**1. Up and down, bending at the knees.**



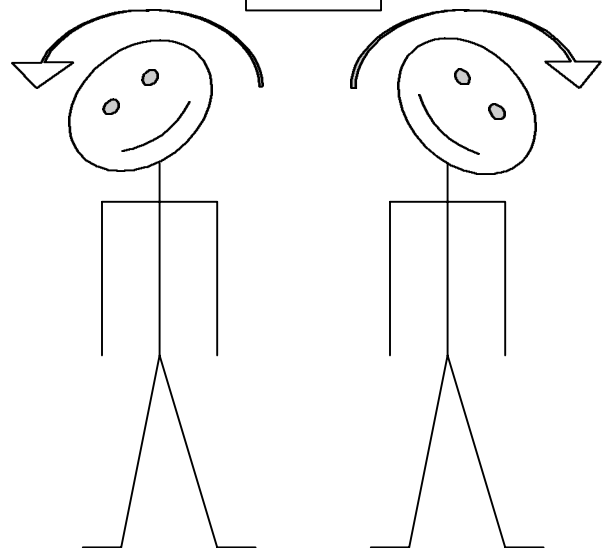
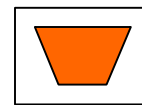
**2. Sway hips back and forth.**



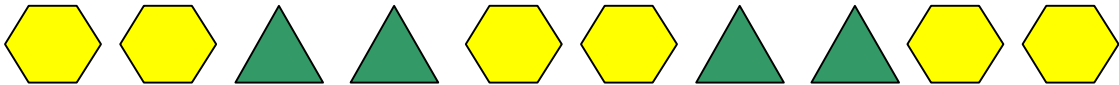
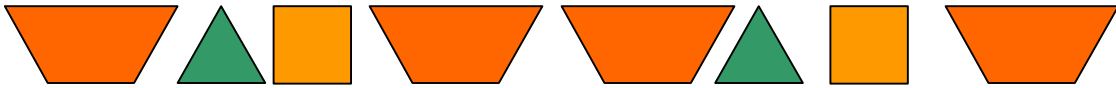
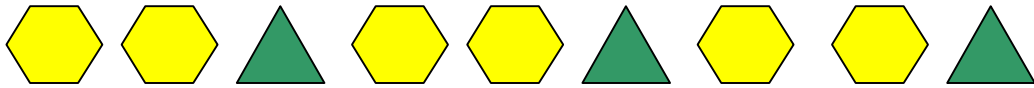
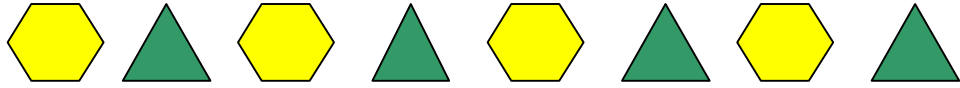
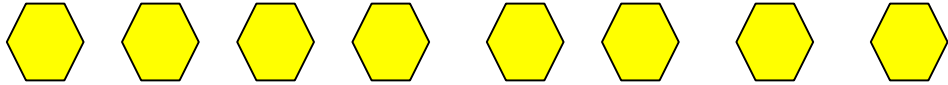
**3. Flap arms like a chicken.**



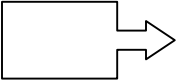
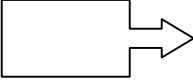
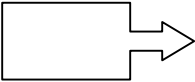
**4. Move head from shoulder to shoulder.**



## Teacher Resource #2 – Pattern Strips



## Teacher Resource #3 - Rubric for Kinesthetic Pattern Strip

Score	Criteria
<b>3</b> 	<p>Student creatively used symbols to represent a kinesthetic pattern.</p> <p>Same symbol always repeated to represent term of the kinesthetic pattern.</p> <p>Symbols always displayed in correct sequence to show the core of the kinesthetic pattern.</p> <p>Student accurately indicated that the pattern continue on the pattern strip.</p> <p>The pattern strip is neatly done.</p> <p>The pattern strip is complete.</p>
<b>2</b> 	<p>Student used symbols to represent a kinesthetic pattern.</p> <p>Same symbol repeated most of the time to represent the term in the kinesthetic pattern.</p> <p>Symbols were displayed most of the time in correct sequence to show the core of the kinesthetic pattern.</p> <p>Student indicated correctly that the pattern did continue.</p> <p>The pattern strip is neatly done.</p> <p>The pattern strip is almost complete.</p>
<b>1</b> 	<p>Student used symbols incorrectly to display the term represented in the kinesthetic pattern.</p> <p>Student sometimes displays symbol in correct sequence to show core of the pattern.</p> <p>Student somewhat indicated correctly that the pattern did continue.</p> <p>The pattern strip is somewhat neatly done.</p> <p>The pattern strip is somewhat complete.</p>

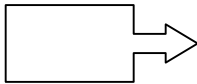


## Teacher Resource #4 - Narrative Rubric

### Score

### Criteria

3



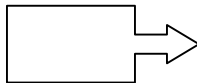
Paragraph presents evidence or information that is specific, accurate and relevant to more than support the answer.

Includes drawings, charts or tables to show steps taken to solve the problem.

Paragraph explains clearly, accurately and thoroughly why the evidence presented supports the conclusion.

The paragraph states a valid conclusion.

2

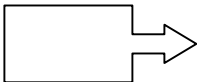


The paragraph presents just enough evidence or information to support the answer.

An attempt was made to show drawings, charts or tables were made to show steps taken to solve the problem.

There are some general descriptions of evidence or something slightly questionable.

1



The paragraph may attempt to provide evidence that supports conclusion.

The paragraph is not strong enough to support the conclusion.

Some information: given evidence may be specific but is general or vague.

Student's Name \_\_\_\_\_

Class period \_\_\_\_\_

Score \_\_\_\_\_